METADATA. THE SHIFT FROM GOOGLE-CENTRIC TO AI-CENTRIC DIGITAL SPACES

JUSTINE TOMS, ORCID ID: 0000-0001-5001-2905

Department of Mass Communications

New Bulgarian University

Summary: Metadata, the foundational descriptor of digital content, has long served as the main key of information retrieval and indexing in internet systems, and even the era before. In the time of Google-centric digital spaces, metadata primarily supported keyword-based search engines that indexed vast quantities of web pages for human query interpretation. However, with the rise of generative artificial intelligence (AI), digital spaces are undergoing a paradigmatic shift toward AI-centricity. This transition alters how metadata is generated, interpreted, and utilized. This article examines the evolving role of metadata in this transition, contrasting static, human-authored metadata with dynamic, AI-generated semantic structures. The paper explores the implications for information architecture, privacy, algorithmic transparency, and the emergence of knowledge synthesis engines. In AI-centric environments, metadata is no longer merely descriptive but becomes an integral part of cognitive frameworks that enable machines to understand, contextualize, and even create knowledge.

Keywords: Metadata, Artificial Intelligence, Information Retrieval, Semantic Web, Generative AI, Digital Spaces, Algorithmic Curation, Knowledge Graphs, Search Engines

The development and the rise of artificial intelligence (AI), particularly generative language technologies like ChatGPT and other large language models, is rapidly transforming the ways in which knowledge is produced, communicated, and evaluated in academic contexts. These tools are not only reshaping how students complete assignments or how educators design assessments, but also challenging fundamental assumptions about authorship, originality, and the communicative processes at the heart of scholarly practice.

From a communication perspective, AI introduces new forms of mediated interaction that blur the boundaries between human and machine-generated content. As students increasingly turn to AI tools for drafting, summarizing, or even ideating, the traditional roles of writer, audience, and evaluator must be reconsidered. This shift raises urgent questions about academic integrity, the transparency

of communicative processes, and the ethical responsibilities of both students and institutions in an AI-augmented learning environment.

Given the pace of these developments, academic standards—many of which were built on assumptions of human-only authorship and static modes of communication—are in urgent need of revision. This article explores how communication scholars and educators can lead the development of new academic frameworks that acknowledge and address the communicative complexities introduced by AI. By examining the intersections of AI, authorship, and academic discourse, this paper aims to contribute to a more ethical, transparent, and future-ready academic ecosystem.

The conversation around artificial intelligence in education has intensified over the past few years, with scholars exploring its impact on pedagogy, assessment, and academic integrity (Luckin et al., 2016; Selwyn, 2019). However, less attention has been paid to how AI technologies are reshaping the communicative foundations of academic work. Communication scholars are uniquely positioned to address this gap by examining how meaning-making, authorship, and message credibility are being redefined in AI-mediated environments.

Traditional academic standards have long centered on clear authorship, original thought, and transparent sourcing—all rooted in a human-centric model of communication (Hyland, 2005). With the advent of AI tools capable of producing high-quality text, these conventions are being unsettled. Studies have begun to note the rise of "AI co-authorship" (Stokel-Walker, 2023), where students and even researchers rely on generative models not just for assistance but for content creation. This has led to institutional confusion over what constitutes plagiarism, proper attribution, or acceptable collaboration with non-human agents (Cotton et al., 2023).

Meanwhile, digital literacy—once focused on evaluating online sources or navigating digital platforms—now must include a nuanced understanding of how AI systems work, their communicative limitations, and their ethical implications. Scholars like Buckingham (2015)[1] and Hobbs (2020)[2] argue for an expanded model of digital literacy that incorporates critical thinking about algorithmic processes and machine-mediated communication.

Despite these emerging insights, few frameworks exist that offer concrete academic standards tailored to the communicative complexities of AI-enhanced learning. This paper aims to bridge that gap by synthesizing current research and proposing communication-focused guidelines for ethical and effective use of AI in academic contexts.

[1] Buckingham, D., Defining digital literacy: What do young people need to know about digital media?, November 2015, Nordic Journal of Digital Literacy 2015(4): p. 21-34

[2] Hobbs, R., Digital and Media Literacy, Connecting Culture and Classroom, NY, 2020.

The intersection of technology and academic communication is not new. Since the advent of the printing press, educational institutions have continually adapted to technological shifts that reshape how knowledge is created, disseminated, and validated. The rise of the internet in the late 20th century brought about a profound transformation, enabling access to vast information resources and fostering new forms of digital literacy (Castells, 2000). These developments challenged traditional pedagogies and prompted educators to rethink the role of media and communication in academic learning.

In the early 2000s, digital tools like spell-checkers, plagiarism detectors, and reference managers began to supplement academic writing practices. These tools were largely seen as assistive rather than transformative. However, the emergence of artificial intelligence, particularly natural language processing (NLP) and machine learning models, has marked a more radical shift. Unlike earlier technologies, generative AI systems—such as OpenAI's GPT series—are capable of producing coherent, contextually relevant, and often high-quality academic prose. This has raised fundamental questions about originality, authorship, and the communicative act of writing itself.

Historically, academic standards have been built on clear lines of human authorship, with rules designed to protect intellectual property and ensure fairness in evaluation. As early as the 18th and 19th centuries, universities began formalizing concepts of plagiarism and citation to preserve the integrity of scholarly discourse. These norms were predicated on the assumption that all content originated from a human mind, working independently or in collaboration with other human authors.

AI has disrupted that foundation. Since around 2019, the integration of AI into writing platforms—ranging from grammar assistance to full essay generation—has become widespread. The COVID-19 pandemic further accelerated this trend, as remote learning environments drove students and faculty toward digital tools for communication, collaboration, and productivity. By 2023–2024, generative AI had moved from novelty to necessity, prompting a wave of institutional responses ranging from bans and detection software to the development of AI use policies and academic guidelines.

This historical trajectory reveals a pattern: with each new communication technology, academia is challenged to renegotiate its standards and practices. The current moment, defined by AI's deep integration into communicative processes, demands a similarly rigorous re-evaluation of what it means to write, share, and assess knowledge in higher education.

Central thesis of this article is: as generative AI technologies fundamentally alter academic communication practices, there is an urgent need to redefine aca-

demic standards through a communication lens—one that accounts for evolving notions of authorship, integrity, and digital literacy in human-AI interactions.

To investigate perceptions of AI use and the evolving communication standards within academic settings, a mixed-methods online survey was conducted in December 2024. The study aimed to capture both quantitative and qualitative insights from students and educators regarding their experiences with and attitudes toward AI-assisted academic work.

A total of 120 participants took part in the study, comprising undergraduate and postgraduate students (n = 95) and academic staff (n = 25) from various disciplines across multiple academic institutions in Bulgaria. Participants were recruited via university mailing lists and academic social media platforms. All participants gave informed consent and were assured anonymity and confidentiality.

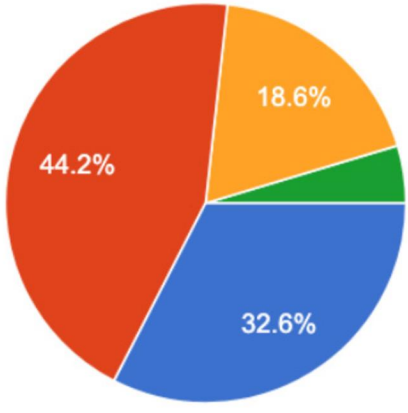
The online survey was hosted on a secure platform and remained open for three weeks. It consisted of three sections:

1. Demographic information – including academic role, discipline, and prior exposure to AI tools.

2. Closed-ended questions – using Likert-scale items to assess attitudes toward AI-generated content, perceptions of academic integrity, and awareness of institutional policies.

Quantitative data were analyzed using descriptive statistics to identify trends in attitudes and usage patterns. Thematic analysis was applied to qualitative responses, following Braun and Clarke's (2006) methodology, to extract key themes related to communication practices, ethical concerns, and expectations for institutional guidance.

Do you use AI for personal purposes?



When asked about their use of AI for personal, non-academic purposes, a majority of participants reported engaging with AI tools to varying degrees:
32.6 – yes, regularly
44.2 – yes, sometimes
18.6 – yes, rarely
4.7% - no

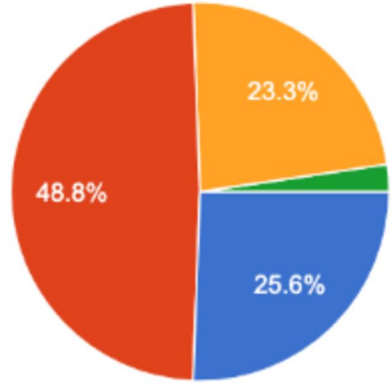
These findings reveal that over 95% of respondents have used AI for personal reasons, suggesting that AI is not only becoming embedded in academic life but is also deeply integrated into everyday communication and information habits. This widespread personal use indicates a growing familiarity and comfort with AI technologies—likely influencing how individuals perceive their legitimacy and appropriateness in academic settings.

The high prevalence of personal AI use reflects a broader cultural shift in communication norms. As individuals become accustomed to relying on AI for tasks such as writing messages, summarizing content, or generating ideas in everyday contexts, the boundary between formal and informal communication begins to blur. This raises critical questions for educators: if AI is already normalized in personal life, how do we teach its responsible and ethical use in academic contexts?

Moreover, the integration of AI into daily habits may make enforcement of AI-related academic policies more difficult. Rather than focusing on prohibition, these findings support the argument for developing communication-focused digital literacy programs that help students reflect on when and how AI is appropriate to use—both inside and outside the classroom.

Do you use AI for academic purposes?

When asked about their use of AI for academic purposes, the following responses were recorded:
25.6 – yes, regularly
48.8 – yes, sometimes
23.3 – yes, rarely
3.2% - no



The majority of participants (about **98%) reported using AI for academic tasks to varying degrees, with nearly 74% using AI at least occasionally (either regularly or sometimes). This highlights AI's increasing presence in academic work, with students and faculty incorporating AI tools like writing assistants, research aids, and even content generators into their academic routines.

The high percentage of respondents using AI for academic purposes reinforces the argument that AI is becoming an indispensable tool in modern education. Whether it's generating ideas, improving writing quality, or assisting in research, AI's role in academia is multifaceted and growing. The fact that over 70% of participants use AI "regularly" or "sometimes" suggests that institutions must address its presence directly in academic policies. The widespread adoption of AI tools in academic contexts further complicates traditional views on authorship, originality, and academic integrity.

This data could indicate a shift in how academic work is approached. As AI becomes more integral to completing assignments or conducting research, there may be a growing expectation for students to be proficient in the ethical use of these tools. However, it also highlights the need for updated academic standards that clearly define acceptable AI usage, ensuring that these tools complement, rather than replace, the learning process.

The relatively small percentage of respondents (3.2%) who do not use AI for academic purposes might point to varying levels of access, awareness, or resistance to these technologies, suggesting that some students and faculty may be more cautious or unfamiliar with AI tools.

Most Used AI Tools for Academic Purposes

When participants were asked which AI tool they use most often for academic purposes, the following responses were recorded:

88.4% – **ChatGPT (free version)**

11.6% – **ChatGPT (paid version)**

16.3% – **Copilot**

11.6% – **Perplexity**

9.3% – **Bing**

7% – **DeepSeek**

The most widely used AI tool for academic purposes was ChatGPT (free version), with 88.4% of participants reporting frequent use. The paid version of ChatGPT was used by 11.6% of participants, while other tools like Copilot (16.3%), Perplexity (11.6%), Bing (9.3%), and DeepSeek (7%) also had notable representation but were less popular compared to ChatGPT.

The dominance of ChatGPT (especially the free version) in academic settings aligns with its widespread availability and user-friendly interface. This suggests that students and educators find ChatGPT particularly accessible for a variety of academic tasks such as writing assistance, brainstorming, summarizing, and even coding. Given the increasing reliance on ChatGPT for academic purposes, insti-

tutions must recognize the potential educational benefits of the tool while also considering its ethical implications and influence on learning outcomes.

The presence of paid versions of ChatGPT among 11.6% of participants may reflect users who seek advanced features such as longer word limits, enhanced functionalities, or faster response times, which can be particularly useful for more intensive academic tasks.

Additionally, the use of other tools such as Copilot, Perplexity, and Bing reveals that there is interest in alternative AI platforms, though they remain secondary to ChatGPT in terms of academic usage. Each of these tools offers unique capabilities, such as Copilot's focus on coding and Perplexity's advanced question-answering capabilities. The lower adoption of these tools may point to their niche use cases or the growing preference for ChatGPT's more generalized approach to academic tasks.

The overwhelming use of ChatGPT, especially the free version, underscores its central role in shaping current academic communication practices. It also indicates that AI tools that are easily accessible, versatile, and user-friendly are the most likely to be adopted in academia. This finding supports the argument that academic policies and standards must evolve to accommodate such tools, ensuring that they are used responsibly and ethically while fostering a culture of transparency and critical engagement.

Awareness of EU AI Regulations

When asked about their awareness of EU regulations regarding AI use, the responses were as follows:

26.2% – Yes

52.4% – No

21.4% – No response

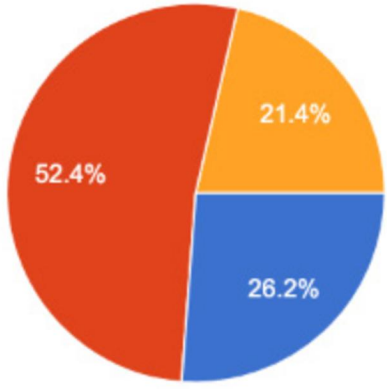
This indicates that a relatively small portion (26.2%) of participants are aware of the existing EU regulations governing AI use, while a significant majority (52.4%) are not familiar with these regulations. The remaining 21.4% did not provide a response.

The low level of awareness regarding EU AI regulations among participants highlights a critical gap in understanding the legal and ethical framework surrounding AI technologies. As generative AI becomes more integrated into academic and personal contexts, understanding regulatory guidelines will be crucial for ensuring ethical AI use. The relatively small proportion (26.2%) of participants who are aware of these regulations suggests that, despite the increasing prevalence of AI tools, there is a lack of widespread education on the legal and

policy aspects of AI.

This finding emphasizes the importance of incorporating AI regulatory education into both academic curricula and institutional training programs. Regulations like the EU's Artificial Intelligence Act[1], which aims to provide a comprehensive legal framework for the use of AI, will become increasingly relevant. Universities and academic bodies will need to ensure that students and faculty are not only familiar with the technological capabilities of AI but also its legal implications and ethical considerations.

The limited awareness of EU AI regulations suggests that there is a need for more targeted education about both AI ethics and legal compliance within the academic environment. As AI technologies become more pervasive in academic settings, institutions should consider integrating AI regulation awareness into digital literacy programs. This can help ensure that AI is used responsibly, in line with current laws and ethical guidelines.



Awareness of Ethical Standards for AI

The responses to the question of whether participants are aware of existing ethical standards for AI use in their academic institutions were as follows:

31% – Don't know

21.4% – Have ethical standards

23.8% – Maybe have ethical standards

7.1% – Don't have ethical standards

16.7% – Follow their own standards

[1] Law and regulations – European commission, https://research-and-innovation.ec.europa.eu/law-and-regulations_en?utm_source=chatgpt.com

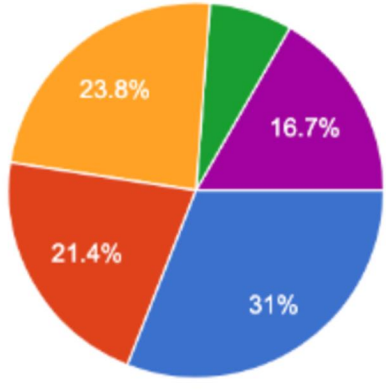
The findings indicate a lack of clarity and consistency in how ethical standards for AI use are addressed in academic institutions. The 31% of participants who are unsure about whether their institution has ethical guidelines for AI use highlight a significant gap in communication about AI policies within academic environments. This uncertainty could reflect a general lack of awareness or inconsistent application of these standards across different departments or faculties.

The 21.4% who reported that their institutions do have ethical standards represent a smaller proportion of respondents. This suggests that while some institutions have taken steps to address the ethical implications of AI in academia, many others have not yet implemented clear or widespread guidelines.

Interestingly, 23.8% of participants indicated that they maybe have ethical standards, indicating a sense of ambiguity around whether policies exist or are being communicated effectively. The 7.1% who said their institutions don't have any ethical standards for AI use further underscores the need for comprehensive and universally applied ethical frameworks in academia, especially as AI tools become more integral to academic work.

Lastly, the 16.7% who reported following their own personal standards for AI use suggest that a portion of the academic community is self-regulating, potentially leading to inconsistent practices, ethical dilemmas, or lack of accountability.

These results highlight the urgent need for institutions to establish clear, formal ethical standards for the use of AI in academic contexts. The lack of awareness and varying responses indicate that policies around AI are still in development or are not being effectively communicated to students and staff. Institutions should prioritize creating accessible, transparent guidelines and provide ongoing education to ensure that AI use in academia aligns with both ethical principles and academic integrity.



In the era of AI, academic institutions face various challenges that require updated standards and policies. One of the primary concerns is that AI tools, such as ChatGPT, have the ability to generate text, assist with research, and even write code. This raises significant questions about academic honesty and how to appropriately address the use of AI in academic work. To manage this challenge, institutions need to update their plagiarism policies to specifically address AI-generated content. This includes defining what constitutes unauthorized assistance and establishing clear guidelines on how AI-generated work should be attributed.

Another challenge is determining authorship in cases where AI contributes to research. As AI can now produce significant portions of academic work, the traditional concept of authorship becomes more complex. Issues regarding intellectual property rights and the recognition of contributions need to be addressed. Institutions should establish clear guidelines on authorship that account for AI's role in the creation process, possibly incorporating co-authorship models where AI's contributions are transparently acknowledged.

AI's involvement in data analysis, simulations, and generating hypotheses is a double-edged sword. While it can enhance research capabilities, it also poses the risk of introducing bias or errors if not used correctly. To mitigate this risk, institutions should develop standards for the ethical use of AI in research. These standards should require transparency in AI methodologies and necessitate the validation of AI-generated results through traditional research methods to ensure their accuracy and reliability.

As AI applications often require large datasets, there is also a challenge concerning the privacy and security of sensitive data. Institutions must implement robust data governance policies that specify how data should be collected, stored, and utilized in AI research. These policies should emphasize the importance of anonymizing datasets and obtaining proper consent from individuals whose data is being used, in order to protect privacy and comply with legal requirements.

AI tools also present a challenge in academic assessments, as they can potentially facilitate cheating. This makes it difficult to assess students' true abilities, especially in exams and assignments. To address this, new assessment methods should be developed that minimize the potential for AI-assisted cheating. These methods could include more oral exams, project-based assessments, and in-person tests, all of which reduce the likelihood of students relying on AI tools to complete their work.

The rapid advancement of AI technology presents another issue for academia: the possibility that curricula may quickly become outdated. To keep pace with AI developments, academic institutions must continuously update their curricula to include the latest AI technologies and their applications. Moreover, students

should not only learn how to use AI tools but also understand their limitations and the ethical implications of their use in academic and professional contexts.

With the growing demand for AI and data science skills across various fields, there is a need to integrate AI literacy into academic curricula. Regardless of their major, students should be taught the basics of AI, machine learning, and data analysis. This integration will ensure that all students are equipped with the knowledge and skills necessary to navigate the increasingly AI-driven world.

Lastly, as the regulatory landscape for AI continues to evolve, academia must stay compliant with both local and international laws. Institutions need to stay informed about changes in AI regulations and align their academic policies accordingly. This includes ensuring compliance with laws related to data protection, AI ethics, and intellectual property, ensuring that AI use remains within legal and ethical boundaries.

AI also has the potential to both enhance and hinder accessibility in education. To address this challenge, AI tools and applications should be designed to be inclusive and accessible to all students, including those with disabilities. It is crucial that AI does not reinforce existing biases or create new barriers to education. Instead, AI should be developed in ways that promote equity and ensure that all students can benefit from its use.

These challenges, along with their proposed solutions, underscore the need for academic institutions to adapt and evolve in the face of AI's growing influence. By developing clear guidelines, policies, and educational frameworks, academia can effectively manage the integration of AI while upholding ethical standards and ensuring accessibility and fairness for all students, at all academic levels.

In conclusion, the integration of AI in academia presents both significant opportunities and challenges. As AI tools become more pervasive in research, teaching, and administrative functions, it is essential that institutions adopt adequate and timely new academic rules to guide their use. These updated rules should be comprehensive, addressing issues related to plagiarism, authorship, data privacy, and academic integrity. It is crucial that ethical frameworks are established not only for students but also for academic and administrative staff, ensuring that everyone in the academic community understands their responsibilities in using AI responsibly and ethically.

Moreover, these frameworks should prioritize accessibility and the discovery of benefits for all students, ensuring that AI tools are inclusive and serve to level the playing field, rather than exacerbate existing inequalities. By designing AI tools that are both accessible and equitable, institutions can create environments where all students, regardless of background or ability, can thrive.

As AI continues to drive technological innovations, institutions must redefine

authorship standards to reflect the collaborative nature of AI-driven work. Establishing clear guidelines on how AI contributions are recognized will be key to maintaining academic integrity and ensuring that intellectual property rights are respected in this new landscape.

By adopting these solutions, academic institutions can foster a responsible, inclusive, and innovative environment that embraces the potential of AI while upholding the core values of education and research.